the Cubes of the apertures of the Object-Glaſſes; and thence to make Teleſcopes of various lengths, magnify with equal diſtinctneſs, the apertures of the Object-Glaſſes, and the Charges or magnifying Powers, ought to be as the Cubes of the ſquare Roots of their lengths; which doth not anſwer to Experience. But the errors of the Rays ariſing from the different refrangibility, are as the apertures of the Object-Glaſſes, and thence to make Teleſcopes of various lengths, magnify with equal diſtinctneſs, their apertures and charges ought to be as the ſquare Roots of their lengths; and this anſwers to experience as is well known. For inſtance, a Teleſcope of 64 Feet in length, with an aperture of $2\frac{2}{3}$ Inches, magnifies about 120 times, with as much diſtinctneſs as one of a Foot in length, with $\frac{1}{3}$ of an Inch aperture, magnifies 15 times.

Now were it not for this different refrangibility of Rays, Teleſcopes might be brought to a greater Perfection than we have yet deſcribed, by compoſing the Object-Glaſs of two Glaſſes with Water between them. Let ADFC repre-
Fig. 28. ſent the Object-Glaſs compoſed of two Glaſſes ABED and and BEFC, alike convex on the outſides AGD and CHF, and alike concave on the inſides BME, BNE, with Water in the concavity BMEN. Let the Sine of Incidence out of Glaſs into Air be as I to R and out of Water into Air as K to R, and by conſequence out of Glaſs into Water, as I to K: and let the Diameter of the Sphere to which the convex ſides AGD and CHF are ground be D, and the Diameter of the Sphere to which the concave ſides BME and BNE are ground be to D, as the Cube Root of KK—KI to the Cube Root of RK—RI: and the Refractions on the concave ſides of the Glaſſes, will very much correct the Errors of the Refractions on the convex ſides, ſo far as they ariſe from the ſphericalneſs of the Figure. And by this means might

might Teleſcopes be brought to ſufficient perfection, were it not for the different refrangibility of ſeveral ſors of Rays. But by reaſon of this different refrangibility, I do not yet ſee any other means of improving Teleſcopes by Refractions alone than that of increaſing their lengths, for which end the late contrivance of *Hugenius* ſeems well accommodated. For very long Tubes are cumberſome, and ſcarce to be readily managed, and by reaſon of their length are very apt to bend, and ſhake by bending ſo as to cauſe a continual trembling in the Objects, whereby it becomes difficult to ſee them diſtinctly: whereas by his contrivance the Glaſſes are readily manageable, and the Object-Glaſs being fixt upon a ſtrong upright Pole becomes more ſteddy.

Seeing therefore the improvement of Teleſcopes of given lengths by Refractions is deſperate; I contrived heretofore a Perſpective by reflexion, uſing inſtead of an Object Glaſs a concave Metal. The diameter of the Sphere to which the Metal was ground concave was about 25 Engliſh Inches, and by conſequence the length of the Inſtrument about ſix Inches and a quarter. The Eye-Glaſs was plano-convex, and the Diameter of the Sphere to which the convex ſide was ground was about $\frac{1}{5}$ of an Inch, or a little leſs, and by conſequence it magnified between 30 and 40 times. By another way of meaſuring I found that it magnified about 35 times. The Concave Metal bore an aperture of an Inch and a third part; but the aperture was limited not by an opake Circle, covering the Limb of the Metal round about, but by an opake circle placed between the Eye-Glaſs and the Eye, and perforated in the middle with a little round hole for the Rays to paſs through to the Eye. For this Circle by being placed here, ſtopt much of the erroneous Light, which otherwiſe would have diſturbed the Viſion. By comparing it with a pretty good Perſpective of four Feet in